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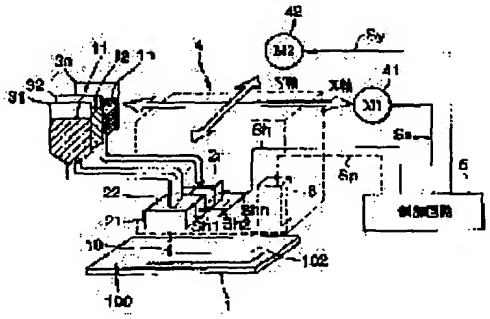
(54) ELECTRIC CIRCUIT, ITS MANUFACTURE AND MANUFACTURE DEVICE THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To manufacture an arbitrary electric circuit on a pattern forming face through the use of an ink jet system.

SOLUTION: Fluid bodies 11-1n containing conductive materials and insulating materials as pattern forming materials are discharged from ink jet-type recording heads 21-2n on the pattern forming face 100 of a substrate 1. The fluid bodies 11-1n discharged on the pattern forming face 110 are caked and an electric circuit 102 is obtained. Since an arbitrary pattern is generated while the materials are changed into various types, the electric circuit containing the desired circuit elements of a capacitor, a coil, a resistor and an active element can be manufactured.



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CLAIMS

[Claim(s)]
[Claim 1] The electrical circuit which is an electrical circuit formed in a pattern formation side, and is characterized by having the pattern with which the fluid containing the charge of pattern formation material adhered to the aforementioned pattern formation side, and was solidified and formed in it.
[Claim 2] The electrical circuit according to claim 1 further equipped with the compatibility layer for raising the adhesion of the aforementioned pattern formation side and the aforementioned pattern.
[Claim 3] The electrical circuit according to claim 1 further equipped with the non-compatibility layer for restricting the adhesion field of the aforementioned pattern.
[Claim 4] The aforementioned charge of pattern formation material is an electrical circuit according to claim 1 which is either among a conductive material, half-conductivity material, an insulating material, or a dielectric material.
[Claim 5] An electrical circuit [equipped with the circuit pattern which the fluid which contained a conductive material as the aforementioned charge of pattern formation material solidified] according to claim 1.
[Claim 6] The electrical circuit according to claim 1 which resembles the insulator layer which the fluid which contained an insulating material or a dielectric material as the aforementioned charge of pattern formation material solidified, and the electrode layer which the fluid which contained a conductive material as the aforementioned charge of pattern formation material countered and solidified on both sides of the aforementioned insulator layer, and constitutes a capacitor more.
[Claim 7] The electrical circuit according to claim 1 to which the fluid which contained a conductive material as the aforementioned charge of pattern formation material equips the aforementioned pattern formation side with the coil which adhered to a whirl and was solidified.
[Claim 8] The electrical circuit according to claim 1 which equips the ends of the half-conductivity film which the fluid which contained half-conductivity material as the aforementioned charge of pattern formation material solidified with the resistor which the fluid which contained a conductive material as the aforementioned charge of pattern formation material solidified.
[Claim 9] The electrical circuit according to claim 1 which the fluid containing the half-conductivity material by which the predetermined element was doped as the aforementioned charge of pattern formation material equips with the semiconductor circuit element formed by solidifying.
[Claim 10] The electrical circuit according to claim 1 to which color which is different in order to have two or more aforementioned patterns and to discriminate a mutual pattern is given.
[Claim 11] The manufacture method of the electrical circuit characterized by having the process which carries out the regurgitation of the fluid which included the charge of pattern formation material in the aforementioned pattern formation side in the manufacture method of the electrical circuit which forms an electrical circuit in a pattern formation side, and the process which solidifies the fluid breathed out by the aforementioned pattern formation side.
[Claim 12] The manufacture method of the electrical circuit according to claim 11 which breathes out the material which heated the aforementioned fluid at the process which carries out the regurgitation beyond the melting point of the aforementioned charge of pattern formation material, and dissolved as the aforementioned fluid, maintains the temperature near [aforementioned] a pattern formation side from the melting point of the aforementioned charge of pattern formation material to low temperature at the process which solidifies the aforementioned fluid, and solidifies the aforementioned fluid.
[Claim 13] The manufacture method of an electrical circuit according to claim 11 characterized by providing the following. The process which breathes out the aforementioned charge of pattern formation material stirred by the solvent as a particle as the aforementioned fluid at the process which carries out the regurgitation of the aforementioned fluid, and solidifies the aforementioned fluid is a process in which the temperature beyond the melting

point of the aforementioned charge of pattern formation material is applied to for the temperature near [aforementioned] a pattern formation side, and the aforementioned particle is dissolved. The process which solidifies the material which applied low temperature and dissolved from the melting point concerned.

[Claim 14] The manufacture method of the electrical circuit [equipped with the process which forms the compatibility layer for raising the adhesion of the aforementioned pattern formation side and the aforementioned pattern before carrying out the regurgitation of the aforementioned fluid] according to claim 11.

[Claim 15] The manufacture method of the electrical circuit [equipped with the process which forms the non-compatibility layer for restricting the adhesion field of the aforementioned pattern before carrying out the regurgitation of the aforementioned fluid] according to claim 11.

[Claim 16] The manufacture method of the electrical circuit characterized by having the process which carries out the regurgitation of the adhesive material to the aforementioned pattern formation side, the process which sprinkles the particle of the charge of pattern formation material to the aforementioned pattern formation side, and the process which removes the aforementioned particles other than the thing adhering to the aforementioned adhesive material from the aforementioned pattern formation side in the manufacture method of the electrical circuit which forms an electrical circuit in a pattern formation side.

[Claim 17] The manufacture method of the electrical circuit according to claim 16 further equipped with the process in which the temperature beyond the melting point of the aforementioned charge of pattern formation material is applied for the temperature near [aforementioned] a pattern formation side after the process which removes the aforementioned particle from a pattern formation side, and the aforementioned particle is dissolved, and the process which solidifies the material which applied low temperature and dissolved from the melting point concerned.

[Claim 18] The manufacture method of the electrical circuit according to claim 16 further equipped with the process which compresses the aforementioned particle adhering to the aforementioned adhesive material after the process which removes the aforementioned particle from a pattern formation side.

[Claim 19] The aforementioned charge of pattern formation material is the manufacture method of the electrical circuit according to claim 11 to 16 which is any one or more [of a conductive material, half-conductivity material, an insulating material, or the dielectric material].

[Claim 20] The manufacture method of the electrical circuit according to claim 11 to 18 which forms a capacitor by breathing out the fluid containing the aforementioned insulating material, forming an insulator layer, breathing out the fluid which contained the aforementioned conductive material so that it might counter on both sides of the insulator layer concerned, and forming an electrode layer.

[Claim 21] The manufacture method of the electrical circuit according to claim 11 to 18 which breathes out the fluid containing the aforementioned conductive material to a whirl, and forms a coil.

[Claim 22] The manufacture method of the electrical circuit according to claim 11 to 18 which forms a resistor by breathing out the fluid containing the aforementioned half conductivity material, forming a half-conductivity film, breathing out the fluid which contained the aforementioned conductive material to the ends of the half-conductivity film concerned, and forming a conductive film.

[Claim 23] The manufacture method of the electrical circuit according to claim 11 to 18 which forms a semiconductor circuit element repeatedly two or more times while changing the element which dopes the process which breathes out the fluid containing the half-conductivity material by which the predetermined element was doped, and forms a semiconductor film to the aforementioned fluid.

[Claim 24] The manufacture method of the electrical circuit according to claim 11 to 18 which makes two or more patterns identifiable by mixing the pigment or color of a color which is different in the fluid for forming the pattern according to a pattern, and forming a pattern.

[Claim 25] The manufacture method of the electrical circuit according to claim 11 to 18 which makes two or more patterns identifiable by forming the layer which covers the pattern formed with the aforementioned fluid and contains the pigment or color of a color according to the pattern.

[Claim 26] The ink-jet formula recording head which is an electrical circuit manufacturing installation for forming arbitrary patterns on a pattern formation side with the fluid containing the charge of pattern formation material, and was constituted by the aforementioned pattern formation side possible [the regurgitation] in the aforementioned fluid, The drive constituted possible [change of the relative position of the aforementioned ink-jet formula recording head and the aforementioned pattern formation side], The solidification equipment which adjusts atmosphere in order to solidify the fluid on the aforementioned pattern formation side, It has the control unit which controls the drive by the regurgitation of the aforementioned fluid from the aforementioned ink-jet formula recording head, and the aforementioned drive, and adjustment of the atmosphere by the aforementioned solidification equipment. the aforementioned control unit Make it breathe out the aforementioned fluid from the ink-jet formula recording head

concerned, moving the aforementioned ink-jet formula recording head along with arbitrary patterns with the aforementioned drive. The electrical circuit manufacturing installation characterized by being constituted possible [formation of an electrical circuit] by solidifying the fluid which adjusted the atmosphere of the aforementioned pattern formation side with the aforementioned solidification equipment, and was breathed out by the aforementioned pattern formation side.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to improvement of the electrical circuit manufacturing technology for starting the manufacturing technology of the electrical circuit to a substrate etc., especially forming arbitrary electrical circuits with an ink-jet method etc.
[0002]
[Description of the Prior Art] The lithography method etc. has been used for manufacturing a minute circuit, for example, an integrated circuit, conventionally. This lithography method applies thinly the sensitization material called resist on a silicon wafer, and prints and imprints with light the circuit pattern created by photoengraving process to the glass film plate. Ion etc. is driven into the imprinted resist pattern and the circuit pattern and the circuit element are formed. Since processes, such as photoengraving process, a resist application, exposure, and development, were needed for manufacture of the electrical circuit using the describing [above] lithography method, when it was not the chip fabrication factory where the facility was ready, manufacture of an electrical circuit was not completed. Moreover, in order to have manufactured the big electrical circuit, discrete part has been arranged by the insertion machine etc. on a substrate, it let the substrate pass to the solder tub, and the electrical circuit substrate was made. Also about the electrical circuit manufactured with such a production line, the insertion machine, the flux tub, the solder tub, etc. were required for the consistent manufacturing facility. On the other hand, it was manufacturing [soldering by a developer attaching all parts using an omnipotent substrate etc., etc. and] by carrying out manufacture of the prototype of an electrical circuit. As mentioned above, in order to mass-produce an electrical circuit, while plant-and-equipment investment and complicated production control were required, producing a prototype had taken an effort and time.
[0003]
[Problem(s) to be Solved by the Invention] Since it is the time of limited production with a wide variety now, the conventional manufacture method is however, efficient and necessarily economical less. That is, the time which requires redo for eye a required hatchet, a setup, or adjustment in a setup of a manufacturing facility whenever the electrical circuit to manufacture is changed increases, and it has been hard coming to stop cost in a production line. Moreover, two or more prototypes were simultaneously made also from manufacture of a prototype, adding examination was performed daily, and it was uneconomical to have spent many hours only on manufacture of a prototype by handmade. moreover, although various physical constants of a circuit element were boiled and changed and the prototype estimated the circuit, the method of attaching passive circuit elements to a substrate had taken the effort, in order to exchange parts, when a physical constant is changed Since a physical constant was decided by passive circuit elements, change of a delicate physical constant was still more difficult for it. Furthermore, although the circuit pattern which becomes complicated in order to examine a circuit needed to be discriminated, by wiring by conventional solder and conventional lead wire, it saw and glanced at the substrate and there was also a trouble that it was unclear what kind of pattern it was at a prototype. In view of the above-mentioned trouble, these people used that technology, such as an ink-jet method, could adhere a fluid by arbitrary patterns, and it hit on an idea to give a new selection branch to the manufacturing technology of an electrical circuit.
[0004]
[Means for Solving the Problem] That is, the 1st technical problem of this invention is offering the electrical circuit suitable for little variety production or the trial production by forming a pattern by the method which did not exist conventionally. The 2nd technical problem of this invention is offering the electrical circuit suitable for little variety production or the trial production by forming a circuit element by the method which did not exist conventionally. The 3rd technical problem of this invention is offering the electrical circuit suitable for the trial production by forming the pattern which is easy to discriminate. The 4th technical problem of this invention is offering the manufacture method

of the electrical circuit suitable for little variety production or the trial production by forming a pattern by the method which did not exist conventionally. The 5th technical problem of this invention is offering the manufacture method of the electrical circuit suitable for little variety production or the trial production by forming a circuit element by the method which did not exist conventionally. The 6th technical problem of this invention is offering the manufacture method of the electrical circuit suitable for the trial production by forming the pattern which is easy to discriminate. The 7th technical problem of this invention is offering the electrical circuit manufacturing installation suitable for little variety production or the trial production by having the composition which forms a pattern by the method which did not exist conventionally.

[0005] Invention which solves the 1st technical problem of the above is an electrical circuit formed in a pattern formation side, and is an electrical circuit equipped with the pattern with which the fluid containing the charge of pattern formation material adhered to the pattern formation side, and was solidified and formed in it.

[0006] Although various kinds of methods, such as various print processes, are applicable as a method to which a fluid is made to adhere here, being based on an ink-jet method is desirable. It is because a fluid can be made to adhere to the arbitrary places of a pattern formation side by arbitrary thickness with a cheap facility according to the ink-jet method. Even if it is the piezo jet method which makes a fluid breathe out by the volume change of a piezo-electric-crystal element as an ink-jet method, when a steam occurs rapidly by impression of heat, you may be the method which makes a fluid breathe out. Moreover, a fluid means the medium equipped with the viscosity in which **** is possible from the nozzle. ** which is it oiliness that it is water is not asked. If it has from the nozzle etc. the fluidity (viscosity) in which **** is possible, even if it will be enough and the individual matter will mix, what is necessary is just a fluid as a whole. A fluidity can be measured, for example with the contact angle of the fluid. For example, as the above-mentioned charge of pattern formation material, you may have either among a conductive material, half-conductivity material, an insulating material, or a dielectric material. What was heated beyond the melting point and dissolved could be stirred as a particle in the solvent, and such material may add the color and the high-performance material of a pigment and others other than a solvent. Moreover, an electrical circuit is not limited only to the member realized by the electric collaboration relation between circuit elements, and is mechanically applied to a design-pattern widely. That is, it is not limited to the pattern formed not having the specific electric feature and having an electrical property with a fixed pattern formation material. Moreover, a pattern formation side points out the front face of a flat substrate, and also may be a curved-surface-like substrate. You may be a front face, although the stiff need does not have the degree of hardness of a pattern formation side and it furthermore has flexibility, such as a film, paper, and rubber.

[0007] this invention is further equipped with the compatibility layer for raising the adhesion of a pattern formation side and a pattern further. Moreover, it has further a non-compatibility layer for restricting the adhesion field of a pattern. Non-compatibility says the relative target to a fluid the property in which a contact angle is large here. Compatibility means that the contact angle to a fluid is relatively small. These expression is used as contrasted with compatibility, in order to clarify behavior of the film to a fluid.

[0008] Invention which solves the 2nd technical problem of the above is an electrical circuit equipped with the circuit pattern which the fluid which contained a conductive material as a charge of pattern formation material solidified. Moreover, it is the electrical circuit which resembles the insulator layer which the fluid which contained an insulating material or a dielectric material as a charge of pattern formation material solidified, and the electrode layer which the fluid which contained a conductive material as a charge of pattern formation material countered and solidified on both sides of the insulator layer, and constitutes a capacitor more. Moreover, the fluid which contained a conductive material as a charge of pattern formation material is the electrical circuit which equips a pattern formation side with the coil which adhered to a whirl and was solidified. It is the electrical circuit which equips the ends of the half-conductivity film which the fluid which furthermore contained half-conductivity material as a charge of pattern formation material solidified with the resistor which the fluid which contained a conductive material as a charge of pattern formation material solidified. Moreover, the fluid containing the half-conductivity material by which the predetermined element was doped as a charge of pattern formation material is an electrical circuit equipped with the semiconductor circuit element formed by solidifying.

[0009] Invention which solves the 3rd technical problem of the above is an electrical circuit to which color which is different in order to have two or more patterns and to discriminate a mutual pattern is given.

[0010] Invention which solves the 4th technical problem of the above is the manufacture method of the electrical circuit equipped with ****** which breathes out the fluid which included the charge of pattern formation material in the pattern formation side, and the process which solidifies the fluid breathed out by the pattern formation side in the manufacture method of the electrical circuit which forms an electrical circuit in a pattern formation side.

[0011] For example, at ****** which breathes out the above-mentioned fluid, the material which heated beyond the melting point of the charge of pattern formation material, and dissolved is breathed out as a fluid, at the process which

solidifies a fluid, the temperature near a pattern formation side is maintained to temperature lower than the melting point of the charge of pattern formation material, and a fluid is solidified. Moreover, the process which breathes out as a fluid the charge of pattern formation material stirred by the solvent as a particle in ****** which breathes out the above-mentioned fluid, and solidifies a fluid is equipped with the process in which the temperature beyond the melting point of the charge of pattern formation material is applied to for the temperature near a pattern formation side, and a particle is dissolved, and the process which solidifies the material which applied temperature lower than the melting point concerned, and dissolved. Moreover, it has the process which forms the compatibility layer for raising the adhesion of a pattern formation side and a pattern before ** which breathes out a fluid. It has the process which forms the non-compatibility layer for restricting the adhesion field of a pattern before ** which furthermore breathes out a fluid.

[0012] Similarly this invention is the manufacture method of the electrical circuit equipped with the process which carries out the regurgitation of the adhesive material to a pattern formation side, the process which sprinkles the particle of the charge of pattern formation material to a pattern formation side, and the process which removes particles other than the thing adhering to an adhesive material from a pattern formation side in the manufacture method of the electrical circuit which forms an electrical circuit in a pattern formation side. Moreover, you may have the process in which the temperature beyond the melting point of the charge of pattern formation material is applied to for the temperature near a pattern formation side, and a particle is dissolved, and the process which solidifies the material which applied low temperature and dissolved from the melting point concerned. You may have the process which compresses the particle which furthermore adhered to an adhesive material.

[0013] The above-mentioned charge of pattern formation material is any one or more [of a conductive material, half-conductivity material, an insulating material, or the dielectric material] here.

[0014] Invention which solves the 5th technical problem of the above is the manufacture method of the electrical circuit which forms a capacitor by breathing out the fluid containing an insulating material, forming an insulator layer, breathing out the fluid which contained a conductive material so that it might counter on both sides of the insulator layer concerned, and forming an electrode layer. Moreover, it is the manufacture method of the electrical circuit which breathes out the fluid containing a conductive material to a whirl, and forms a coil. It is the manufacture method of the electrical circuit which forms a resistor by breathing out the fluid which furthermore contained half-conductivity material, forming a half-conductivity film, breathing out the fluid which contained a conductive material to the ends of the half-conductivity film concerned, and forming a conductive film. Moreover, it is the manufacture method of the electrical circuit which forms a semiconductor circuit element repeatedly two or more times, changing the element which dopes to a fluid the process which breathes out the fluid containing the half-conductivity material by which the predetermined element was doped, and forms a semiconductor film.

[0015] Invention which solves the 6th technical problem of the above is the manufacture method of the electrical circuit which makes two or more patterns identifiable by mixing the pigment or color of a color which is different in the fluid for forming the pattern according to a pattern, and forming a pattern. Moreover, by forming the layer which covers the pattern formed with the fluid and contains the pigment or color of a color according to the pattern, it is the manufacture method of the electrical circuit which makes two or more patterns identifiable.

[0016] Invention which solves the 7th technical problem of the above is an electrical circuit manufacturing installation for forming arbitrary patterns on a pattern formation side with the fluid containing the charge of pattern formation material. The ink-jet formula recording head constituted by the pattern formation side possible [the regurgitation] in the fluid, The drive constituted possible [change of the relative position of an ink-jet formula recording head and a pattern formation side], It has the control unit which controls adjustment of the atmosphere by the solidification equipment which adjusts atmosphere in order to solidify the fluid on a pattern formation side, and the drive by the regurgitation of the fluid from an ink-jet formula recording head, and the drive and a solidification equipment. And the control unit is constituted possible [formation of an electrical circuit] by solidifying the fluid which was made to breathe out a fluid from the ink-jet formula recording head concerned, moving an ink-jet formula recording head along with arbitrary patterns with a drive, adjusted the atmosphere of a pattern formation side with the solidification equipment, and was breathed out by the pattern formation side.

[0017]

[Embodiments of the Invention] Hereafter, the best gestalt for carrying out this invention is explained with reference to a drawing. The same member shall be shown when the same sign as other operation gestalten is used with each following operation gestalt.

(Operation gestalt 1) The operation gestalt 1 of this invention manufactures the electrical circuit which contained the capacitor using the ink-jet method. The block diagram of the electrical circuit manufacturing installation used for drawing 1 with this operation gestalt 1 is shown. As shown in drawing 1 , this electrical circuit manufacturing

installation is equipped with the ink-jet formula recording heads 21-2n (n is the arbitrary natural numbers), Tanks 31-3n, the drive 4, and the control circuit 5. It is constituted possible that this electrical circuit manufacturing installation makes the predetermined pattern (electrical circuit) 102 form in the pattern formation side 100 of a substrate 1 by making the drop 10 of a fluid adhere.

[0018] If the ink-jet formula recording heads 21-2n are equipped with the respectively same structure and the ink-jet method constitutes the fluid possible [the regurgitation], they are enough. Drawing 29 is a decomposition perspective diagram explaining the example of 1 composition of an ink-jet formula recording head. As shown in drawing 29 , ink-jet formula recording head 2x (x is either 1 - n) insert in a case 250 the pressure room substrate 220 in which the nozzle plate 210 in which the nozzle 211 was formed, and the diaphragm 230 were formed, and are constituted. this principal part structure of ink-jet formula recording head 2x -- the perspective diagram of drawing 30 part -- as shown in a cross section, it has the structure which put the pressure room substrate 220 by the nozzle plate 210 and the diaphragm 230 The nozzle 211 is formed in the position which will correspond to a cavity 221 when a nozzle plate 210 is stuck with the pressure room substrate 220. Two or more cavities 221 are formed in the pressure room substrate 220 possible [a function] for each as a pressure room by **********ing a silicon-single-crystal substrate etc. It dissociates by the side attachment wall (septum) 222 between cavities 221. Each cavity 221 is connected with the reservoir 223 which is common passage through the feed hopper 224. A diaphragm 230 is constituted by for example, the thermal oxidation film etc. The ink tank mouth 231 is formed in a diaphragm 230, and tank 3x are consisted of possible [supply of arbitrary fluid 1x]. The piezo-electric-crystal element 240 is formed in the position equivalent to the cavity 221 on a diaphragm 230. The piezo-electric-crystal element 240 is equipped with the structure which sandwiched the crystal of piezoelectric ceramics, such as a PZT element, by the up electrode and the lower electrode (not shown). It is constituted possible that the piezo-electric-crystal element 240 produces a volume change corresponding to the regurgitation signal Shx supplied from a control circuit 5.

[0019] In addition, although the above-mentioned ink-jet formula recording head was the composition of having made a piezo-electric-crystal element producing a volume change, and making a fluid breathing out, you may be the head composition which heat is applied [composition] to a fluid with a heating element, and makes a drop breathe out by the expansion.

[0020] Tanks 31-3n store Fluids 11-1n, respectively, and the ink-jet formula recording heads 21-2n constitute 11-1n of each fluid possible [supply] through the pipe. As for Fluids 11-1n, each is installed according to the function of a pattern including pattern formation material. Fluid itself shows electrical properties, such as conductivity, half-conductivity, insulation, or a dielectric, at the time of solidification, and consists of especially these operation forms. For example, what heated metals of the low melting point, such as solder, a gallium, and Pb, beyond the melting point, and gave the fluidity, and the thing which shows an electrical property only by drying a fluid after ****, including the particle of pattern formation material with high density are mentioned. Viscosity is adjusted and a fluid is constituted from any case by the solvent etc. so that the fluidity in which **** is possible may be presented from an ink-jet formula recording head. In addition, in order that this operation form may make the talk easy to understand, a fluid 12 shall contain [a fluid 11] a conductive material including an insulating material.

[0021] The drive 4 is equipped with a motor 41, a motor 42, and the machine structure that is not illustrated. The motor 41 is constituted by X shaft orientations (longitudinal direction of drawing 1) possible [conveyance] in ink-jet formula recording head 2x according to the driving signal Sx. The motor M2 is constituted by Y shaft orientations (the depth direction of drawing 1) possible [conveyance] in ink-jet formula recording head 2x according to the driving signal Sy. In addition, the drive 4 is enough if it has relatively the composition which can change for the position of ink-jet formula recording head 2x to a substrate 1. For this reason, even if the substrate 1 other than the above-mentioned composition moves to ink-jet formula recording head 2x, both ink-jet formula recording head 2x substrates 1 may move.

[0022] A control circuit 5 is equipped with CPU which is a computer apparatus and is not illustrated, memory, an interface circuitry, etc. When a control circuit 5 performs a predetermined program, making the equipment concerned enforce the manufacture method of the electrical circuit of this invention is constituted possible. That is, in making the drop 10 of a fluid breathe out, when supplying the regurgitation signals Sh1-Shn to ink-jet formula recording heads [21-2n] either and moving the head concerned, it is constituted by motors 41 or 42 possible [supply of driving signals Sx or Sy].

[0023] In addition, when fixed atmosphere processing is needed from ink-jet formula recording head 2x to the drop 10 of a fluid, you may have the solidification equipment 6 further. Corresponding to the control signal Sp with which a solidification equipment 6 is supplied from a control circuit 5, physical, physicochemical, and performing chemical preparation to a drop 10 or the pattern formation side 100 are constituted possible. For example, the fluid which adhered by the stoving processing by blasting of hot blast, laser radiation, and lamp irradiation, the chemical change

processing by medication of a chemical, fixed surface-treatment processing to the pattern formation side 100 of a drop 10 that controls the grade of adhesion is solidified, or adhesion of a drop 10 is promoted.

[0024] (Operation) In the composition of the above-mentioned electrical circuit manufacturing installation, if a substrate 1 is installed in the equipment concerned, a control circuit 5 will output driving signals Sx or Sy. Motors 41 or 42 change the relative position of ink-jet formula recording head 2x and the pattern formation side 100 of a substrate 1 corresponding to these driving signals Sx or Sy, and move head 2x to a pattern formation field. subsequently, the kind of pattern which should be formed -- conductivity, half-conductivity, and insulation -- or according to a dielectric electrical property, Fluids [11-1n] either is specified, and the regurgitation signal Shx for making the fluid breathe out is supplied Each fluids 11-1n are flowing into the corresponding cavity 221 of ink-jet formula recording head 2x. In ink-jet formula recording head 2x to which the regurgitation signal Shx was supplied, the piezo-electric-crystal element 240 produces a volume change with the voltage applied between the up electrode and lower electrode. This volume change is made to deform a diaphragm 230, and changes the volume of a cavity 221. Consequently, the drop 10 of a fluid is breathed out towards the pattern formation side 100 from the nozzle hole 211 of the cavity 221. The fluid which decreased in number by the regurgitation is newly supplied to the cavity 221 by which the fluid was breathed out from tank 3x.

[0025] (The manufacture method) Next, based on drawing 2 or drawing 4 , the formation method of the capacitor of this operation form is explained. In each drawing, (a) shows the manufacturing process cross section cut by the center line of a circuit element, and (b) shows a plan.

Insulator layer formation process (drawing 2) : First, the ink-jet formula recording head 21 is moved to the field which forms an insulator layer, as shown in drawing 2 (a), and the fluid 11 which contains an insulating material as a pattern formation material from the head 21 concerned is made to breathe out. As an insulating material, SrTiO3, BaTiO3, and the Pb(Zr, Ti) O3 grade which are SiO2, aluminum 2O3, and a dielectric can be considered. PGMEA, a cyclohexane, carbitol acetate, etc. are mentioned as a solvent. As a wetting agent or a binder, you may add a glycerol, a diethylene glycol, ethylene glycol, etc. if needed. Moreover, as a fluid 11 containing an insulating material, you may use the metal alkoxide containing polysilazane or insulator material. In this case, insulator material can be formed according to heating, a chemical reaction, etc. The breathed-out fluid 11 reaches the pattern formation side 100. The fluid 11 which reached the target has an about dozens of micrometers diameter. If a head 21 is moved like drawing 2 (b) and the regurgitation of the fluid 11 is continuously carried out along a pattern formation field, a rectangular insulator layer pattern can be formed macroscopically. The dielectric constant of the width of face of an insulator layer 101, length, and an insulating material is defined according to the capacity of a capacitor to form. The capacity of a capacitor is because it becomes settled with the area, gap, and dielectric constant of a counterelectrode. What is necessary is just to manufacture to a laminated structure as it breathes out the still more nearly same fluid and is made to solidify on the once solidified film, when thickening membranous thickness.

[0026] since there is no electric bad influence even if the film which was solidified and was formed is not a precise film when a fluid contains an insulating material, a solvent component is evaporated -- being sufficient . However, heat-treating in order to strengthen a film is desirable. Moreover, when solidifying an insulator layer by the chemical reaction, it is possible to process with a chemical which brings about destruction of a dispersed system. For example, when a fluid 11 makes a principal component the organic pigment distributed by styrene-acrylic resin, the regurgitation of the magnesium-nitrate solution is carried out as reaction mixture. Moreover, when a fluid 11 makes an epoxy resin a principal component, the regurgitation of the amines is carried out as reaction mixture. It is desirable to perform solidification, whenever it forms one pattern. It is because a desired electrical property will not be acquired since material is mixed if the regurgitation of the fluid which contained other pattern formation material in the fluid which is not solidified in piles is carried out.

[0027] In addition, you may use a dielectric material instead of an insulating material as a pattern formation material. It is because the capacity of a capacitor can be made to increase if it makes inter-electrode fill up with a dielectric material. Moreover, by two or more material, it may be parallel and two or more insulator layers may be formed. It is because the function similar to the multilayer structure of a capacitor can be given. Moreover, when there are few gaps of an electrode, it is desirable to choose an insulating material as this insulator layer indicates non-compatibility to be to the fluid 12 containing a conductive material breathed out behind. It is because risk of an electrode short-circuiting decreases since the insulator layer formed crawls a fluid 12.

[0028] Electric conduction film formation process (drawing 3 and drawing 4) : If an insulator layer 101 solidifies, the ink-jet formula recording head 21 will be moved to the field which forms an electric conduction film as shown in drawing 3 (a) and drawing 4 (a). Subsequently, the fluid 12 which moves a head 22 like the arrow of drawing 3 (b) and drawing 4 (b), and contains a conductive material as a pattern formation material is made to breathe out. The electric conduction film 102 which serves as an electrode of a capacitor by this is formed. As a conductive material of pattern

formation material, RuO2, IrO2, OsO2, MoO2, ReO2, WO2, YBa2Cu 3O7-x, Pt, Au, Ag and In, an In-Ga alloy, Ga, solder, etc. can be considered. As a solvent, butyl carbitol acetate, a 3-dimethyl-2-IMITAZO lysine, BMA, etc. can be considered. As a fluid 12 containing a conductive material, where melting is carried out by heating etc., you may use low melting point metals, such as In-Ga, In, and solder. The pattern of an electric conduction film can be changed into the other various configuration of a form like drawing 2 or drawing 4 . For example, the capacity of a capacitor can be made to increase further if it forms so that the electrode which forms each electric conduction film and an insulator layer serrate and in the shape of toothing, and counters may gear. In order to enlarge capacity of a capacitor, it is desirable to form highly the height of an insulator layer 101 and the height of the opposed face of the electric conduction film 102, and to enlarge electrode area.

[0029] Subsequently, in order to acquire a desired electrical property, solidification of an electric conduction film is performed. When the fluid 12 contains the particle of conductive material, such as a metal, as a pattern formation material, as shown in drawing 5 (a) and (b), particles are scattered in a solvent at fluid 12b breathed out from the ink-jet formula recording head 22. Only by evaporating a solvent from this fluid, pattern formation material does not continue and conductivity cannot be secured. For this reason, as shown in drawing 6 , it heats by solidification-equipment 6 grade beyond the melting point of a conductive material. A solvent evaporates by this processing, and also pattern formation material dissolves, and a particle connects mutually and unifies. When a fluid 12 dissolves pattern formation material, a conductive material is deposited by evaporating a solvent in heat-treatment. When pattern formation material is material, such as a metal heated beyond the melting point, you may solidify a conductive material by maintaining a pattern formation side from the melting point to low temperature.

[0030] Moreover, you may form an electric conduction film at a process as shown in drawing 7 or drawing 9 . By this method, the regurgitation of the fluid 13 which included the charge of a binder from the ink-jet formula recording head 23 as first shown in drawing 7 (a) and (b) is carried out to the pattern formation field of an electric conduction film. As such a charge of a binder, in not carrying out heating at high temperature, it uses a thermosetting resin adhesive, an elastomeric adhesive, emulsion system adhesives, etc. When carrying out heating at high temperature, the poly aromatics, ceramic system adhesives, etc. are mentioned. Subsequently, the particle 131 which has conductivity all over pattern formation side 100 as shown in drawing 8 (a) and (b), for example, a metal powder, is sprinkled. Subsequently, if the particle 131 which has conductivity from the pattern formation side 100 is blown off as shown in drawing 9 (a) and (b), the particle 131 which has conductivity will paste only the pattern formation field to which the charge of a binder is applied, and it will remain in it. Then, if it heats to the temperature beyond the melting point of the particle which has conductivity as drawing 6 explained, a particle 131 will dissolve on the front face of the charge of a binder, it will connect mutually, and the continuation pattern which has conductivity will be formed. You may heat-treat by impressing an ultrasonic wave simultaneously, sprinkling a particle furthermore. According to heating by the ultrasonic wave, good pattern formation of an electrical property can be performed. Moreover, if the particle after adhesion of a particle is compressed, particles can connect and an electrical property can be raised. You may use together a method besides compression and the above of a particle. In addition, you may apply the material which has a dielectric besides [which has conductivity] material to the above-mentioned particle. The capacity of a capacitor can be raised if it applies to a capacitor. The inductance of a coil can be raised if it applies to a coil by making a magnetic material into the above-mentioned particle.

[0031] Moreover, an electric conduction film may form a compatibility film as a ground layer using the fluid with which the pattern formation side 100 and adhesion contained a high material of compatibility in the low case to the fluid. For example, as shown in drawing 10 , the regurgitation of the high fluid 14 of compatibility is carried out to a membranous pattern formation field from the ink-jet formula recording head 24 to a fluid 12. For example, if a fluid 12 is an organic material, porous materials, such as a resin, paraffin and an aluminum oxide, and a silica, will be breathed out, and the compatibility film 104 will be formed. Since the compatibility film 104 has a fluid 12 and good adhesion, as shown in drawing 11 , if the regurgitation of the fluid 12 is carried out on the compatibility film 104, a fluid 12 will stick on the compatibility film 104, it will spread, and the good electric conduction film 102 of adhesion will be formed. On the other hand, when [that the pattern formation side 100 and adhesion have a good electric conduction film] elapsing and spreading too much, you may form a non-compatibility film using the fluid containing the material which shows non-compatibility to a fluid. For example, as shown in drawing 12 , the regurgitation of the low fluid 15 of compatibility is carried out to the both sides of the pattern formation field of an electric conduction film from the ink-jet formula recording head 25 to a fluid 12. For example, if a fluid 12 is the material which shows a hydrophilic property, porous materials, such as a resin, paraffin and an aluminum oxide, and a silica, will be breathed out, and the non-compatibility film 105 will be formed. Since the non-compatibility film 105 crawls a fluid 12, if the regurgitation of the fluid 12 is carried out along a pattern formation field as shown in drawing 13 , with the non-compatibility film 105 of both sides, a fluid 12 will be crawled and a fluid will not spread more than the gap of the non-compatibility film

105. For this reason, the electric conduction film 102 with which the form was ready is formed. In addition, what has adhesion, such as low dielectric material, SiO2, aluminum2O3, and TiO2, and insulation is mentioned to an effective material as a ground layer. In addition, you may apply the process which prepares the above-mentioned compatibility film and a non-compatibility film to the film of an insulator layer and others.

[0032] A capacitor 121 can be formed in the pattern formation side 100 as an electrical circuit according to many above-mentioned processes. If the electric conduction film 102 is lengthened, the area of a counterelectrode is extended or dielectric material is breathed out to the extension of an insulator layer 101 top or the electric conduction film 102 when the capacity of a capacitor 121 is insufficient, as a result of actually measuring, fine tuning of capacity is possible. If the capacitor formed first is set a little as ****** from a desired capacity, capacity is made to increase behind and it can be set as the optimal capacity.

[0033] Since the insulator layer and electric conduction film of a capacitor are formed with an ink-jet method according to this operation gestalt 1 as mentioned above, the capacitor of arbitrary configurations can be manufactured with the cheap and small equipment according to the ink jet printer used by the home printer. Even when fine tuning is required, capacity can be easily increased to especially the capacity of a capacitor.

[0034] (Operation gestalt 2) The operation gestalt 2 of this invention manufactures the electrical circuit containing the capacitor of a gestalt which is different in the above-mentioned operation gestalt 1. With this operation gestalt 2, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used.

[0035] (The manufacture method) Next, based on drawing 14 or drawing 16 , the formation method of the capacitor of this operation gestalt is explained. In each drawing, (a) shows the manufacturing process cross section cut by the center line of a circuit element, and (b) shows a plan.

[0036] Electric conduction film formation process (drawing 14) : First, the ink-jet formula recording head 22 is moved to the field which forms an electric conduction film, as shown in drawing 14 (a), and the fluid 12 which contains a conductive material as a pattern formation material from the head 22 concerned is made to breathe out. About a fluid 12, it is the same as that of the above-mentioned operation gestalt 1. In order to enlarge capacity of a capacitor, the electric conduction film 102 is formed in as big a field as possible. If a head 22 is moved like the arrow of drawing 14 (b) and the regurgitation of the fluid 12 is carried out, the electric conduction film 102 used as the lower electrode of a capacitor can be formed. What is necessary is just to process like the above-mentioned operation gestalt 1 about solidification.

[0037] Insulator layer formation process (drawing 15) : A lower electrode is covered, the ink-jet formula recording head 21 is moved so that it may be shown subsequently to drawing 15 (a), and the fluid 11 which contains an insulating material as a pattern formation material from the head 21 concerned is made to breathe out. About a fluid 11, it is the same as that of the above-mentioned operation gestalt 2. A head 21 is moved like drawing 15 (b), and the regurgitation of the electric conduction film 102 which is a lower electrode about a fluid 11 is carried out to a wrap pattern formation field. Although the width of face of an insulator layer 101 has the capacity of a capacitor raised so that it is thin, it also has the risk of an inter-electrode short circuit. For this reason, an insulator layer 101 is formed in the thickness which is the grade from which sufficient insulation is obtained. Moreover, the capacity of a capacitor can be raised if an insulator layer 101 is formed with a dielectric material. About solidification of a fluid 11, it is the same as that of the above-mentioned operation gestalt 1.

[0038] Electric conduction film formation process (drawing 16) : If an insulator layer 101 solidifies, as shown in drawing 16 (a), will move the ink-jet formula recording head 21 on an insulator layer, and the fluid 12 which contains a conductive material from the head 22 concerned will be made to breathe out, and the laminating of the electric conduction film 102 will be carried out further. Move a head 22 like the arrow of drawing 16 (b), and breathe out a fluid 12, it is made to solidify, and the electric conduction film 102 used as the upper electrode of a capacitor is formed. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.

[0039] A capacitor 122 can be formed in the pattern formation side 100 as an electrical circuit according to the above-mentioned process. In addition, it is desirable to form the area of an upper electrode more smallish to the area of a lower electrode. It is because capacity can be made to increase easily if the area of an upper electrode is made to increase by the ink-jet method to change capacity behind.

[0040] Since according to this operation gestalt 2 the same effect as the above-mentioned operation gestalt 1 is done so and also the area of an electrode can be greatly set up as mentioned above, a mass capacitor can be manufactured. If especially the upper electrode is formed more smallish, fine tuning of the capacity of a capacitor is possible only by making the area of an upper electrode increase.

[0041] (Operation form 3) The operation form 3 of this invention manufactures the electrical circuit containing the coil. With this operation form 3, the same electrical circuit manufacturing installation as the above-mentioned operation form 1 is used.

[0042] (The manufacture method) Based on drawing 17 or drawing 19 , the formation method of the coil of this operation form is explained. In each drawing, (a) shows the manufacturing process cross section cut by the center line of a circuit element, and (b) shows a plan.
Electric conduction film formation process (drawing 17) : The fluid 12 containing a conductive material is made to breathe out, moving the ink-jet formula recording head 22, as first shown in drawing 17 (a) and (b), and the electric conduction film 102 equivalent to the outgoing line of a coil is formed. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation form 1. In addition, the inductance of a coil can be made to increase, if a magnetic material is beforehand applied on the pattern formation side 100 or a magnetic material is applied between the spiral electric conduction films 102.
[0043] Insulator layer formation process (drawing 18) : The fluid 11 which is made to move the ink-jet formula recording head 21 so that it may be shown subsequently to drawing 18 (a), and contains an insulating material is made to breathe out, it leaves the nose of cam of the electric conduction film 102 like drawing 18 (b), and an insulator layer 101 is formed. You may prepare an insulator layer only in a part for the intersection of the electric conduction film which does not prepare an insulator layer greatly as shown in this drawing, but is formed by drawing 17 , and the electric conduction film formed by drawing 19 . About a fluid 11 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.
[0044] Whirl electric conduction film formation process (drawing 19) : It is made to move spirally, as shown in drawing 19 (a), making the fluid 12 which subsequently contains a conductive material from the ink-jet formula recording head 21 breathe out, and the spiral electric conduction film 102 is formed. This spiral electric conduction film 102 touches the electric conduction film 102 which the center formed by drawing 17 as shown in drawing 19 (b). The electric conduction film which also formed the portion of a whorl-like throat previously is not contacted. A vortical number of turns and the width of face of the electric conduction film 102 are defined according to the inductance value of a coil to manufacture. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.
[0045] A coil 123 can be formed in the pattern formation side 100 as an electrical circuit according to the above-mentioned process. In addition, what is necessary is just to lengthen the further spiral electric conduction film 102 from a spiral edge to increase the inductance of a coil 123 behind. Moreover, what is necessary is just to add an outgoing line from the middle of the already formed spiral electric conduction film 102, when the phenomenon of the inductance is carried out.
[0046] As mentioned above, according to this operation gestalt 3, a coil can be easily manufactured as an electrical circuit with an ink-jet method. moreover -- increasing an inductance behind or making it decrease **** -- etc. -- fine tuning can also be made easy
[0047] (Operation gestalt 4) The operation gestalt 4 of this invention manufactures the electrical circuit containing the resistor. With this operation gestalt 4, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used. However, it has further the tank 33 and the ink-jet formula recording head 23 for carrying out the regurgitation of the fluid 13 which contained the electrical resistance materials of half-conductivity as a pattern formation material. As electrical resistance materials, mixture [with conductive powder and insulating powder], nickel-Cr, Cr-SiO, Cr-MgF, Au-SiO2, AuMgF, PtTa 2O5, AuTa2O5Ta2, Cr3Si, and TaSi2 grade is mentioned, and PGMEA, a cyclohexane, carbitol acetate, etc. are mentioned as the solvent. As a wetting agent or a binder, you may add a glycerol, a diethylene glycol, ethylene glycol, etc. if needed. Moreover, as a fluid 13 containing an insulating material, you may use the metal alkoxide containing polysilazane or insulator material. In this case, insulator material can be formed according to heating, a chemical reaction, etc. Electrical resistance materials are decided according to the resistance of a resistor to form.
[0048] (The manufacture method) Based on drawing 20 or drawing 22 , the formation method of the resistor of this operation gestalt is explained. In each drawing, (a) shows the manufacturing process cross section cut by the center line of a circuit element, and (b) shows a plan.
Resistance film formation process (drawing 20) : The ink-jet formula recording head 23 is moved as first shown in drawing 20 (a) and (b). And the fluid 13 which contains electrical resistance materials from the head 23 concerned is made to breathe out, and the resistance film 103 for giving electric resistance is formed. About solidification, it is the same as that of the above-mentioned operation gestalt 1. In addition, about the width of face, height, and length of the resistance film 103, it decides according to the resistance of a resistor to form. The resistance of a resistor is because it is proportional to length and is in inverse proportion to the cross section. In addition, this resistance film 103 of setting up height and width of face so that it may become bigger resistance than the resistance used as a target is desirable. It is because the height and width of face of the resistance film 103 can be made to be able to increase behind and resistance can be lowered to a proper value.

[0049] Electric conduction film formation process (drawing 21 and drawing 22) : If the half-electric conduction film 103 solidifies, the ink-jet formula recording head 22 will be moved as shown in drawing 21 and drawing 22 , the fluid 12 containing a conductive material will be breathed out, and the electric conduction film 102 will be formed in the ends of the half-electric conduction film 103. About a fluid 12 and its solidification, it is the same as that of the above-mentioned operation gestalt 1.

[0050] A resistor 124 can be formed in the pattern formation side 100 as an electrical circuit according to the above-mentioned process. In addition, if a fluid 13 is further breathed out on the half-electric conduction film 103, thickness of the half-electric conduction film 103 is thickened or width of face is enlarged to tune the resistance of a resistor 124 finely behind, resistance can be lowered even to a proper value.

[0051] As mentioned above, according to this operation gestalt 4, a resistor can be easily manufactured as an electrical circuit with an ink-jet method. Moreover, it can also make it easy to tune resistance finely behind.

[0052] (Operation gestalt 5) The operation gestalt 5 of this invention applies this invention to wiring in the meantime using the conventional discrete part as a circuit element. With this operation gestalt 5, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used. However, the process by the equipment or the help for arranging parts to the pattern formation side of a substrate 1 is required. Based on drawing 23 and drawing 24 , the electrical circuit manufacture method of this operation gestalt is explained. Each drawing is a plan of a pattern formation side.

Part arrangement process (drawing 23) : By the insertion machine or the help, discrete part is arranged in a suitable position on the pattern formation side 100 of a substrate 1. The arrangement is defined according to an electrical circuit to manufacture. In drawing 23 , the resistor 110, the capacitor 111, and the transistor 112 are arranged as a chip. As for each part article, it is desirable to paste up with bond etc. In addition, it is desirable to also perform this adhesion with an ink-jet method. For example, as shown in drawing 25 (a) and (b), the fluid 17 containing the charge of a binder is breathed out to a field to paste up parts from the ink-jet formula recording head 27, and the adhesion film 107 is formed in it. Since this adhesion film 107 has only to be able to carry out the temporary stop of the parts, it may be formed in a field smaller than the area covered with parts. And what is necessary is just to stick parts (resistor 110) by insertion machine 7 grade on the adhesion film 107, as shown in drawing 26 . In addition, the resin hardened by the epoxy resin or energy as a charge of a binder is applied. For example, parts can be pasted up by temperature setup of the heat which will be applied if thermosetting resin and thermoplastics are used.

[0053] Wiring process (drawing 24) : If parts paste up, the circuit pattern which connects between parts using the fluid 12 which contains a conductive material as a pattern formation material is formed. About a conductive material or its solidification, it is the same as that of the above-mentioned operation gestalt 1. What is necessary is to form an insulator layer 101 in a part for the intersection of wiring, and just to form the electric conduction film 102 further on it after forming the electric conduction film 102 which turns down, when making a circuit pattern cross. In addition, you may solder the circuit pattern which consists of electric conduction films 102, and the terminal of each part article. You may solder by the ink-jet method. If solder is heated more than a melting temperature and it is made to breathe out from an ink-jet formula recording head, soldering will be made easily.

[0054] In addition, although the circuit element was performed by discrete part and wired by the ink-jet method in the above-mentioned operation gestalt, you may manufacture a part or all of a circuit element by the ink-jet method like each above-mentioned operation gestalt. That is, discrete part is adopted as a mass capacitor, the coil of a high inductance, and the active element of complicated composition, and an ink-jet method is applied to the circuit element which can be easily formed in a pattern formation side.

[0055] As mentioned above, when discrete part is used according to this operation gestalt 5, wiring can be easily done with an ink-jet method. An electrical circuit can be manufactured even if there is a circuit element which is hard to form especially by the ink-jet method. Moreover, if the fixed form substrate which has arranged discrete part by fixed arrangement beforehand is manufactured, arbitrary electrical circuits can be constructed using an ink-jet method.

[0056] (Operation gestalt 6) In case the operation gestalt 6 of this invention forms many circuit patterns in a pattern formation side like the operation gestalt 5, it is related with the manufacture method of the electrical circuit which makes each other discriminate. With this operation gestalt 5, the same electrical circuit manufacturing installation as the above-mentioned operation gestalt 1 is used. However, the tank 22 and the ink-jet formula recording head 22 which make the fluid 12 containing a conductive material breathe out are made to correspond to the kind of circuit pattern, and are prepared. [two or more] The different color and different pigment of a color are made to mix in each fluid 12, and it constitutes. As a color, a stilbene system, an oxazole system, an imidazolone system, a coumarin system, etc. can be used as a fluorescent whitening dye. An azo system, an anthraquinone system, an indigo system, and a sulfuration system can be used as a general color. The oak and FENOJIN which are made into the oak specifically made black, 2, 4-dinitrophenols, the oak made into yellow, m-toluylene diamines, and red are mentioned. As a pigment, an insoluble

azo system, an azo lake system, a phthalocyanine system, etc. can be used. Since the pigment consists of coloring particles, a single molecule does not check electric conduction like a color. For this reason, it is more desirable to use a pigment. Each circuit pattern is classification-by-color beam ****** by wiring of an analog circuit, and wiring of a digital circuit in classifying by color by for example, power supply wiring, grounding wiring, and its outcrossing line ****. For example, in drawing 27 , it is classified by color with the power supply wiring 108, the grounding wiring 109, and the other wiring 102. What is necessary is just to form an insulator layer 101 in a part for the intersection of wiring, as shown in drawing 27 (b), when a circuit pattern crosses.

[0057] In addition, the circuit pattern itself may not be classified by color, but a circuit pattern may be classified by color by the wrap coloring film. For example, in drawing 28 , the coloring film 130 covers the electric conduction film 102 which is a circuit pattern, and it is formed. Formation of the coloring film 130 should just make the resin in which the pigment and the color were included breathe out with an ink-jet method. Insulation can be secured, even when forming the coloring film 130 by the resin etc. and a circuit pattern crosses, since it had insulation. Moreover, since neither a pigment nor a color is contained in the electric conduction film 102, a possibility of checking electric conduction also disappears. You may classify by color by using a conductive material properly according to a circuit pattern, without using a color using there being a color still more peculiar to the conductive material itself. For example, in white, if it is copper and is silver and platinum about red, if it is gold, it is yellowish. Therefore, if the fluid containing a different conductive material is breathed out and an electric conduction film is formed instead of changing a pigment and a color, a certain amount of classification by color is possible.

[0058] Moreover, what did not necessarily need to manufacture by the ink-jet method and was manufactured, other the methods, for example, photo lithography method etc., etc., is sufficient as a circuit pattern. It is because the same effect is done so as long as the circuit pattern is classified by color.

[0059] Since according to this operation gestalt 6 the circuit pattern was classified by color mutually and manufactured as mentioned above, according to the electrical circuit concerned, it is easy to recognize the path and parts of the wiring to the time of failure and improvement of a circuit, and leads to easy-ization of work. Moreover, when classification by color is adopted with a production line, maintenance and check can be made easy.

[0060] (Other modifications) it is not based on the above-mentioned operation gestalt, but this invention can be deformed and applied to various For example, although the above-mentioned operation gestalt showed the manufacture method of a capacitor, a coil, and a resistor, you may apply this invention to manufacture of active elements, such as diode and a transistor. What is necessary is just to use as a fluid what doped various elements for semiconductor materials, such as silicon and germanium. You may dope behind. By carrying out the laminating of many semiconductor films of an electronic majority carrier, and reactionary films of an electron hole majority carrier in various configurations, adjusting carrier density, it is also possible to manufacture the semiconductor which was being manufactured by epitaxial growth with an ink-jet method. If the same laminated structure as various kinds of semiconductors which were being manufactured in the usual semiconductor process is formed, all well-known semiconductor devices can be manufactured.

[0061] Moreover, before the regurgitation of the fluid by the above-mentioned ink-jet method, various surface-treatment processings may be combined and may be performed. For example, well-known various methods, such as the method to which a reverse spatter is applied with the method of applying a silane coupling agent according to the existence of the polar molecule of a fluid as processing which carries out a surface treatment so that a pattern formation side may be equipped with compatibility, an argon, etc., corona discharge processing, plasma treatment, UV irradiation processing, ozonization, and degreasing processing, are applied. When a fluid does not contain a polar molecule, well-known various methods, such as the method to which a reverse spatter is applied with the method of forming porous membranes, such as the method and aluminum oxide which apply a silane coupling agent, and a silica, an argon, etc., corona discharge processing, plasma treatment, UV irradiation processing, ozonization, and degreasing processing, can be applied. It may etch into the film formed by the pattern formation side or the ink-jet method, irregularity may be prepared, and compatibility may be adjusted.

[0062] The pattern furthermore formed by the ink-jet method may be formed in a pattern formation side not only for an electrical circuit but for the mechanical ******-[again] purpose. It is because the advantage of the ink-jet method that a detailed pattern can be easily formed with a cheap facility can be made to enjoy as it is.

[0063]

[Effect of the Invention] Since arbitrary patterns can be formed in a pattern formation side by making a fluid adhere according to this invention, the electrical circuit suitable for little variety production or the trial production, its manufacture method, and a manufacturing installation can be offered. That is, the electrical circuit of cheaply fixed quality can be offered, without using a large-scale plant. Moreover, since addition of a pattern is easy according to the ink-jet method, the change of a circuit constant and the addition of wiring in a circuit element can be performed easily.

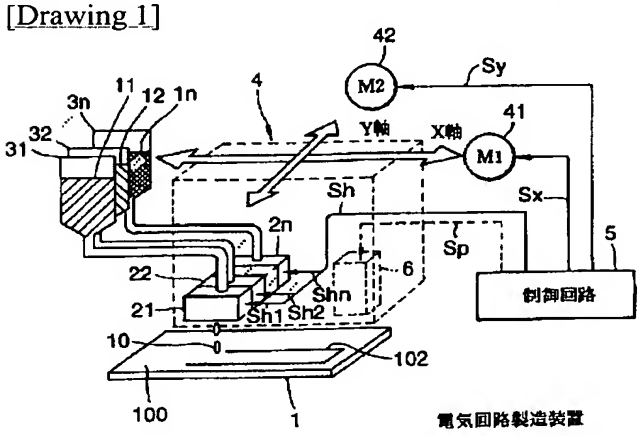
[0064] Since according to this invention the color was changed according to the pattern and discernment of a pattern was made easy, the electrical circuit suitable for the trial production and its manufacture method can be offered. Therefore, also in a trial production, it becomes analyzable [a circuit] for a short time, and the increase in efficiency of circuit evaluation can be attained.

[Translation done.]

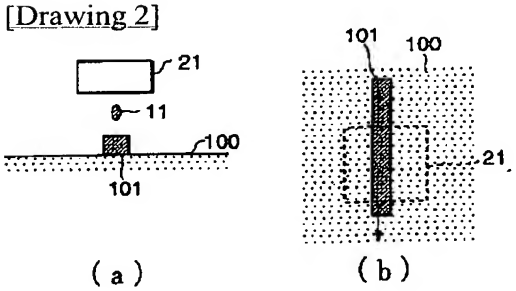
* NOTICES *

DRAWINGS

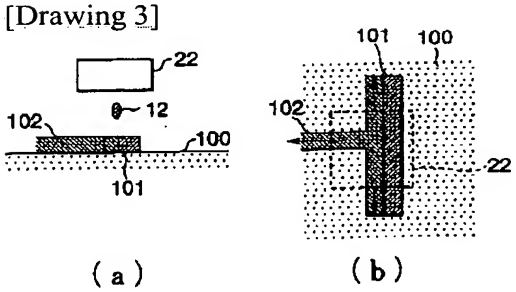
[Drawing 1]



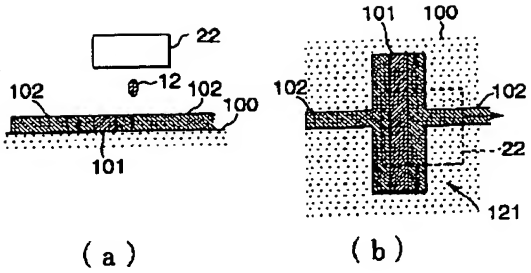
[Drawing 2]



[Drawing 3]

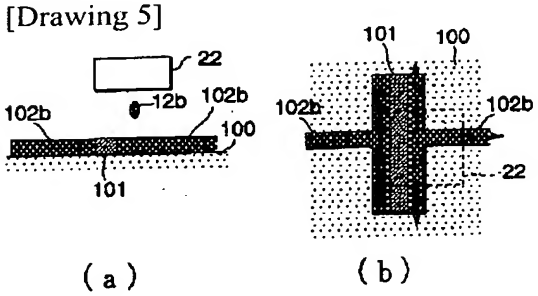


[Drawing 4]



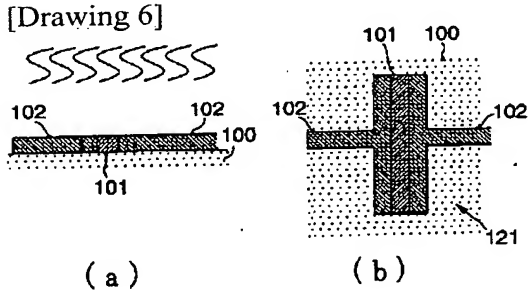
(a) (b)

[Drawing 5]



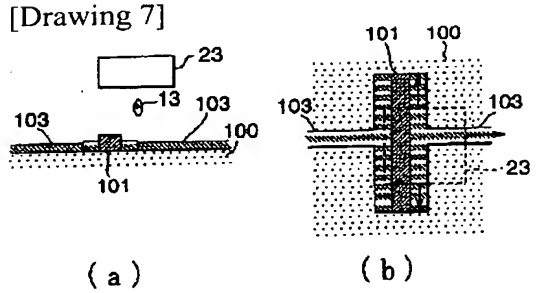
(a) (b)

[Drawing 6]



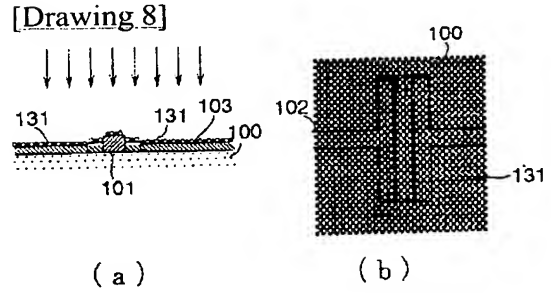
(a) (b)

[Drawing 7]



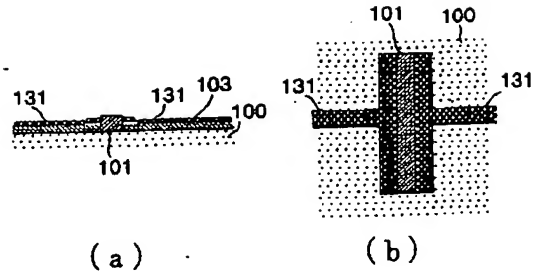
(a) (b)

[Drawing 8]



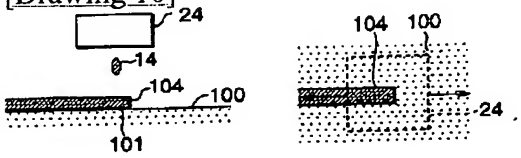
(a) (b)

[Drawing 9]



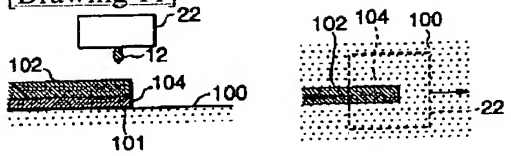
(a) (b)

[Drawing 10]



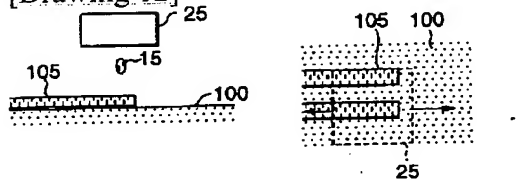
(a) (b)

[Drawing 11]



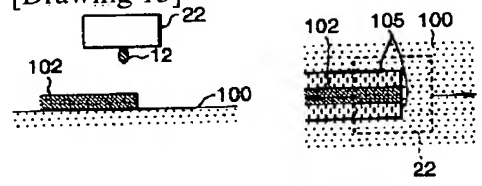
(a) (b)

[Drawing 12]



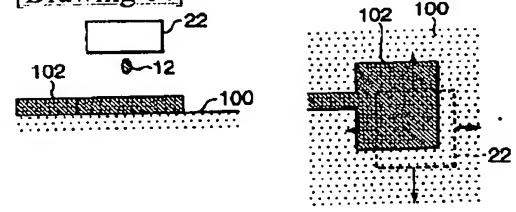
(a) (b)

[Drawing 13]



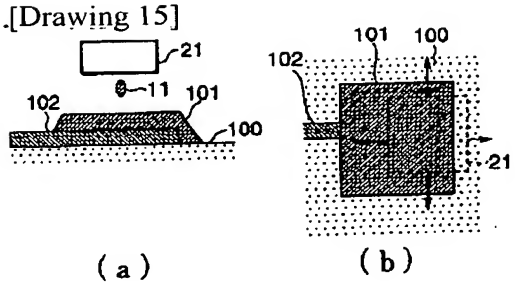
(a) (b)

[Drawing 14]

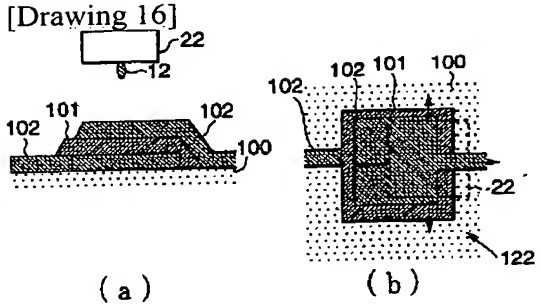


(a) (b)

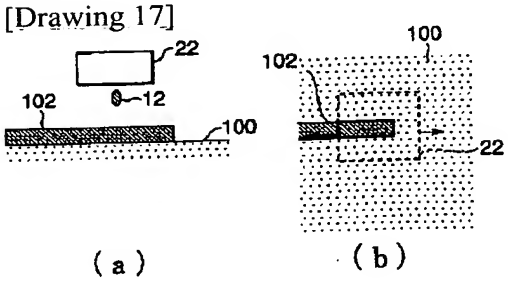
[Drawing 15]



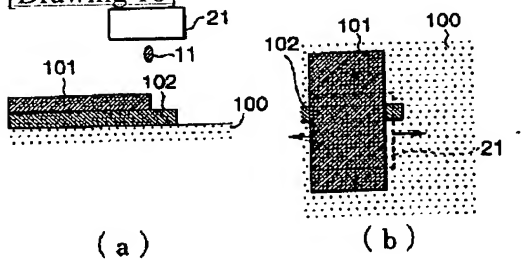
[Drawing 16]



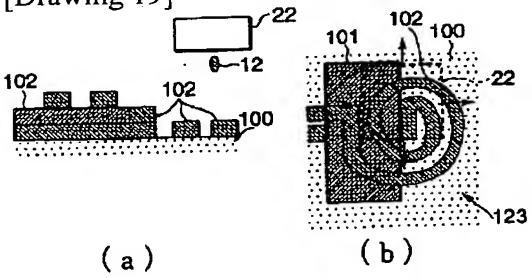
[Drawing 17]



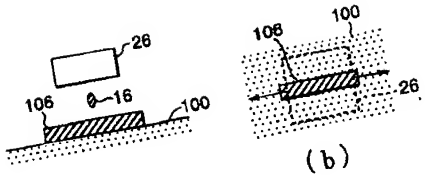
[Drawing 18]



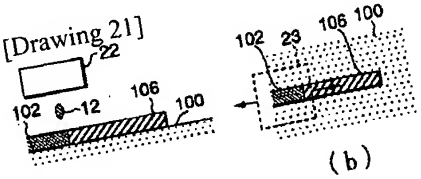
[Drawing 19]



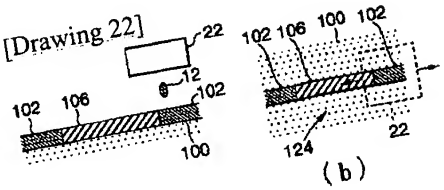
[Drawing 20]



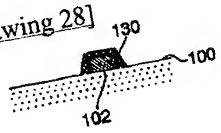
[Drawing 21]



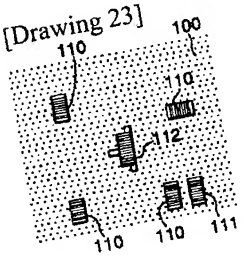
[Drawing 22]



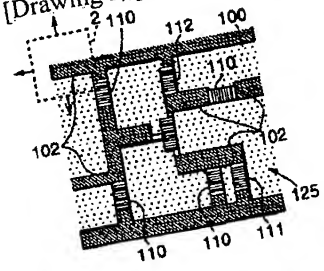
[Drawing 28]



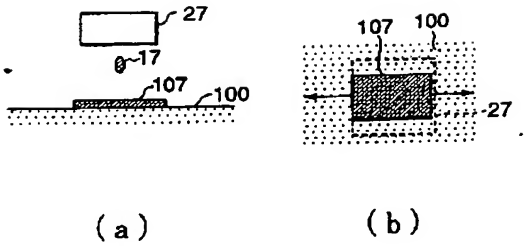
[Drawing 23]



[Drawing 24]

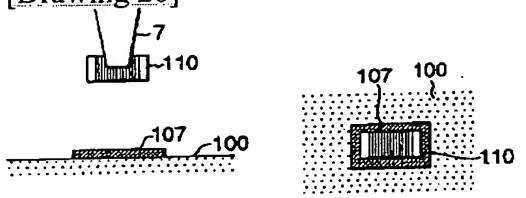


[Drawing 25]



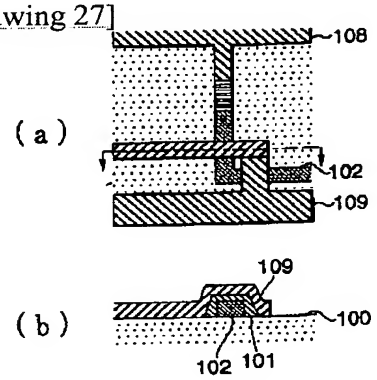
(a) (b)

[Drawing 26]

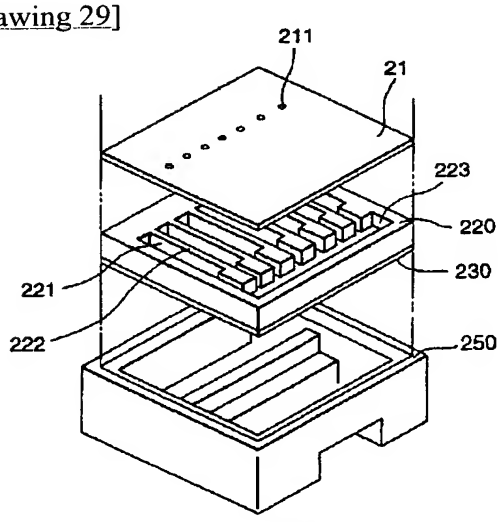


(a) (b)

[Drawing 27]

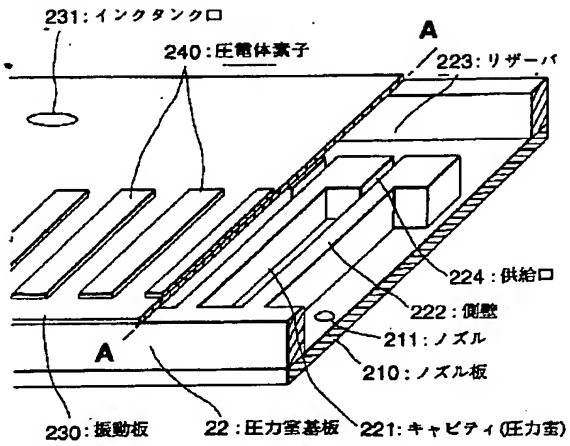


[Drawing 29]



2x インクジェット式記録ヘッド

[Drawing 30]



[Translation done.]